

INTRODUCTION.

NEARLY six years ago the writer issued a call to members of the Wilson Ornithological Chapter of the Agassiz Association, to begin a critical study of Warbler songs (family *Mniotiltidæ*). The object of this call was to secure a mass of notes descriptive of the songs, from many sources, so that by comparison and tabulation a fairly accurate representation of each song could be put upon paper. It was also hoped that the diurnal as well as the seasonal song period of each species could be determined accurately, and that many other little understood phenomena might become better known. The author of the scheme of study well understood the wide lack of acquaintance among the class of lay ornithologists with the large majority of the family, and hoped that this might be a means of awakening widespread interest in our most beautiful and interesting group of birds. But the responses were few indeed, indicating that the difficulties were greater than could be overcome by the average bird student. Lack of time to devote to the swiftly passing migrants in the early days of May was undoubtedly one great obstacle in the way of many a willing worker.

Failing in this plan, but anxious to bring the host of Warblers closer to those who do not already know them by their voices, the writer has undertaken the task of bringing together all printed descriptions of Warbler songs at his command, combining them with such contributions as have been made in manuscript, and his own notes representing fifteen years of study, thus presenting what is known to him of the songs of the Warblers. On another page will be found a complete list of the works consulted, including books and periodicals. The writer fully realizes that this is far from a complete bibliography of the subject, but it will illustrate the resources at hand.

The task of bringing together such a mass of printed and

manuscript descriptions has been second only to the task of determining in each case what must be allowed as a margin for the personal equation of the describer, and how much must be allowed for variation in the species. No intelligent comparison of the several descriptions could be made without a fairly satisfactory solution of these two difficulties. The method has been to select some species whose songs are clearly distinctive and not seriously variable. Three were selected: Oven-bird, Maryland Yellow-throat and Black-throated Green Warbler. The variation among the individual describers, when determined, will give the variation of the species.

There must be a large margin for mistakes allowed, particularly with the species whose songs are not personally known to the writer. A little study of ones notes in successive years will serve to show that we are prone to variations in our methods of representing the same songs from year to year, allowing as much as we please for variations of the individuals composing the species. The way our ears hear bird songs is often determined by our digestion. But there is always the possibility of finding an average for the whole series of notes. That has been the writer's effort in the body of the paper—to present the average of all notes of equal value.

Five years of teaching Ornithology in Oberlin College to all sorts of students, serve to show that descriptions of color patterns and habits are not adequate to the task of bringing this assemblage of small birds to the notice of the average person who becomes interested in birds. The song seems to be the missing link in the chain of acquaintance. Both the eye and the ear must be educated if one would learn the birds, and my experience indicates that the ear is the readier learner. Is that probably due to a tendency to color-blindness, or to weak eyesight on the one hand, and to a long series of unconscious ear training, on the other?

It is to the class of bird students who hope to find pleasure in acquaintance with the Warblers, rather than to those who already know them that this paper is addressed. It is hoped that by arranging the species in groups according to greater or less resemblance to each other it will enable the student to give special attention to one group before attempting the larger study of the whole group, thus some-

what simplifying the process of study. If this paper should prove of any assistance to lay ornithologists, and to those who find pleasure in casual notice of birds, the labor of preparing it will be fully repaid.

Acknowledgements are gladly made to Mr. H. W. Carriger, Sonoma, Calif. ; Mr. N. Hollister, Delavan, Wis. ; Miss Ethel Dane Roberts, Wooster, Ohio ; and Mr. Benj. T. Gault, Glen Ellyn, Ill., for valuable manuscript notes upon original field work. Particularly to Mr. Frank L. Burns, Berwyn, Pa., for painstaking study of several species not accessible to the writer, and for constant interest and encouragement when the future of the study looked dark and forbidding. Most of all are thanks due Professor Albert A. Wright for constant encouragement, and for patience and forbearance with me during "warbler time," when the many voices from the tree-tops proved more alluring than the duties which rightly called my attention away from the birds. Finally, it is with real pleasure that the writer reminds the reader of the close companionship, so often more than hinted in former numbers of this BULLETIN, between himself and Rev. W. L. Dawson, now of Ahtanum, Washington ; a fellowship to which the paper now presented owes far more than appears upon its pages.

While the serial arrangement of the species does not follow that adopted by the American Ornithologists' Union, the nomenclature does. The number following the name of the species will indicate its systematic position. It has seemed better to group the species according to their songs rather than according to their structural relationships. The geographical range, which always closes the discussion of each species, has been taken bodily from the A. O. U. Check List of North American Birds.

BIBLIOGRAPHY OF WARBLER SONGS.

THE following list of books and periodicals contains only those in which something of use bearing directly upon the subject has been found. General works on birds which contain no mention of Warblers are therefore excluded, but books treating the general subject of bird song, even tho they contain nothing specifically upon the warblers, are included. Neither here nor in the body of the report does it seem desirable to cumber the pages with exact references in the majority of cases. In many of the books the Warblers may readily be found in their systematic position, arranged in the accepted systematic order, and in nearly every book the index will prove a sufficient guide to the page from which the reference has been taken. With periodicals the case is somewhat different, and here specific references will be given where they seem necessary, in the body of the paper.

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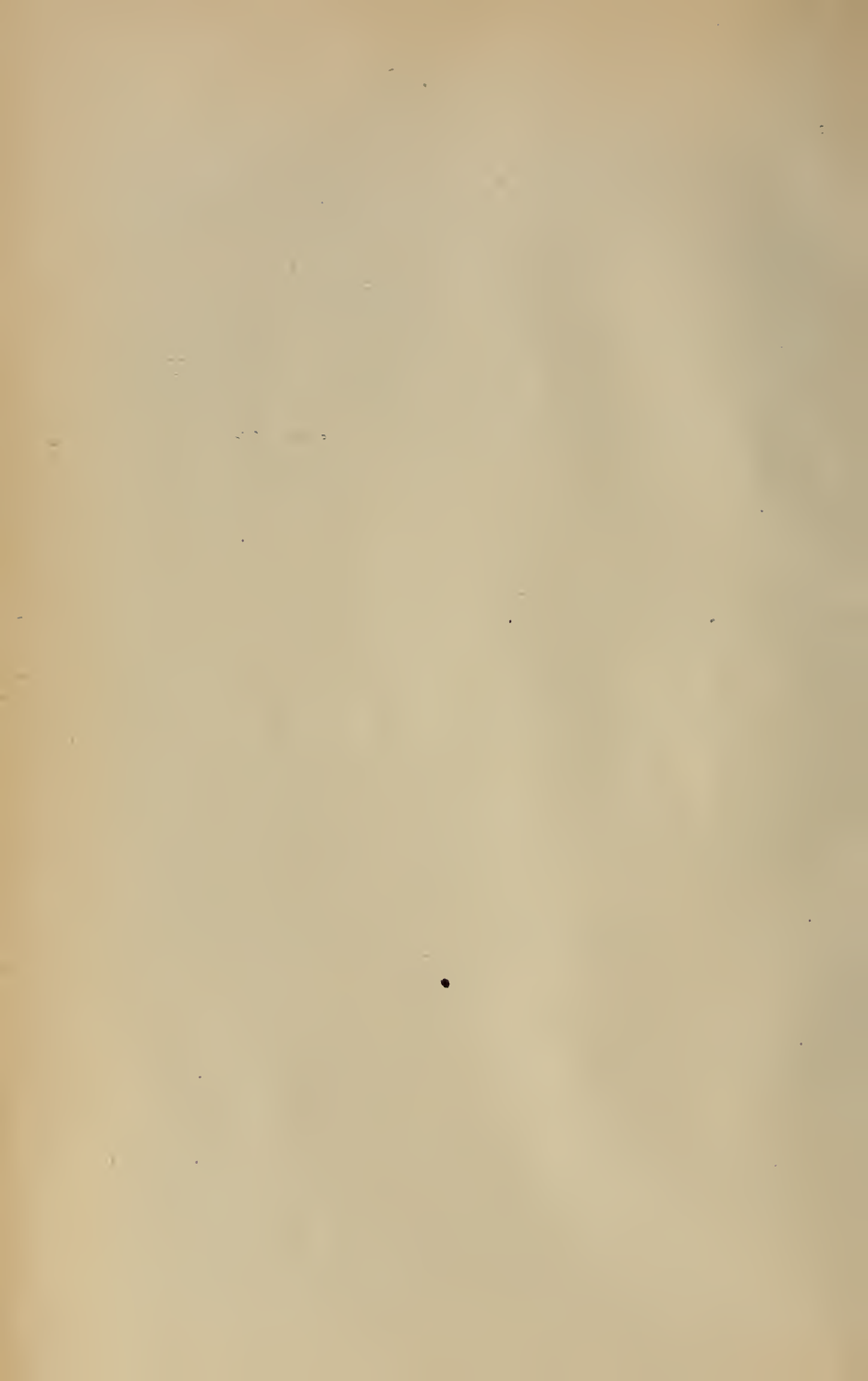
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 Knight, Ed. Bangor, Me.

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- Iowa Ornithologist, now Western Ornithologist. (D. L. Sav-
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- Nidologist. H. R. Taylor, Ed. Alameda, Calif.
- Oologist, The. Frank H. Lattin, Ed. Albion, N. Y.
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WARBLER SONGS.

IN the development of birds away from the primitive reptilian type, there has been, in general, a tendency to decrease in size as well as to structural modifications brought about by changing environment. In order to increase greatly in numbers there must be a decrease in size if the world were to contain the host. Along with decrease in size there seems to have developed a tendency to vocal expression, culminating at the present day in utterances second only to speech—song. We are unable to attribute to a bird's vocal utterances, however complex they may seem, more than a momentary state of feeling, unless it be taught by man. Only the smaller birds truly sing; the muscles of their syrinx enabling them to give utterance to varied notes instead of a monotonous repetition of the same note.

In the higher development of the Oscines—the singing birds—there naturally grew differences in song just as there grew differences in structure and habits, producing more or less well defined groups. We might reasonably expect that if a group be sharply marked off from other groups structurally its style of song would also be sharply marked; that it would possess a distinct song-type; and if there be gradations between groups there would naturally be gradations in song likewise. In general we find this to be true, but in particular there are exceptions. Thus, while the Warblers certainly possess a song-type it distinctly grades off to the Sparrows, which are not otherwise closely related to them. So we are forced to find and define the song-type and work both ways from it out to the limits, and there seek to distinguish certainly between the two which seem to grade into each other.

The warbler song-type may be defined as a high pitched, hissing whistle consisting of two well defined parts, usually on a different pitch. There are many and decided departures from this type, the one extreme being a monotonous repetition

of a single note like the Chipping Sparrow, the other a composite song so varied that it approaches a mimicry of many songs. I have selected the Yellow Warbler as representing nearly the type song of the family. We might further say that this type song usually consists of about eight syllables, the first phrase of four or five uttered more slowly, the remainder more rapidly and on a different pitch, sometimes higher, sometimes lower. With some species the pitch is so high that it approaches the vanishing point to many ears. But there is an indefinable woodsy quality to all warbler songs which is not shared by the members of any other group which bears any troublesome resemblance to the warbler songs. It is a quality that can be learned in a little time with the birds as they sing, but cannot be transferred by word of mouth or printed signs. Before leaving the song-type let me define the hissing whistle. It can be closely imitated by forcing the breath over the tip of the tongue as it is held against the upper teeth, modulating the pitch of the resulting thin whistle with the lips instead of with the tongue as in the ordinary direct whistle.

SONG PERIODS. DIURNAL.

Having learned the Warbler song-type, we are prepared to begin a study of the separate songs as the species pass in review before us. We shall not proceed far in this study before we discover that certain times of the day are preferred for singing by most of the species. Their day begins in the early morning twilight with a burst of song, and is carried with the quest for food as the light strengthens; the intervals between songs gradually lengthening as the day advances, until the appetite is satisfied, when the bird ceases song to rest until the afternoon brings round the feeding time again. The afternoon song period is marked by less singing than the morning, and the twilight marks its close. It is difficult to say when the morning period ends and the afternoon begins in the case of any individual birds; but in general, we hear few songs between ten in the morning and three in the afternoon, especially during warm weather, when the noon hours are of high temperature. During cool or wet weather the morning period begins later and the evening closes earlier, while some

birds will be in song all day long. But it must be remembered that some species do not follow any rule about their singing, and that with the majority of the species we know little about them except as they pass us on their way to the north. It may well be that the all night journey, as they migrate, makes the noon-day sleep necessary, while at their breeding grounds they have little need for that rest and so sing all day. But with many of the species which remain with us to nest there is the noon-day resting time all the season.

SEASONAL.

There are seasonal song periods as well as diurnal. These will be spoken of in the discussion of the several species, so that I need only discuss here the general subject.

Most male Warblers sing more or less during their northward journey, and until the care of the young leaves no time for song. Singing begins at least as soon as the northward journey begins, reaches its height while the mate is brooding over the eggs, then gradually declines as the cares of the family increase, ceasing entirely with the beginning of the molt which follows closely the complete development of the young into independent foragers. After the plumage has been renewed, some species have a short song period before leaving for the south again. It is difficult to say how large a number thus renew their song, but the writer's list includes twelve species positively identified, with several others about which there may be some doubt. It is more than likely that a far larger number sing at some time during the autumn months, either regularly or occasionally. Few songs will be heard, during this second song period, except in the early morning hours under favorable conditions. With some species the second song period is marked by a somewhat different song, and with many by a weaker one.

It is suggestive that the species which are known to sing during autumn are those whose color patterns are practically the same at all seasons, or at least not markedly different in fall from the spring dress. The spring song period is accompanied by enlargement of the reproductive organs, but the resumption of song in the fall is rarely so accompanied. It is not likely that all individuals of a species which has a second

song period sing then, but that a few do. Many are too fat to sing, and no doubt many do not sufficiently recover from the debilitating effects of the molt to sing.

It is not unusual to hear feeble attempts at song early in the autumn from not fully fledged birds, sounding like a bird whose vocal chords were unable yet to respond to the will. Gradually the song becomes more and more perfect as the days pass until it again becomes normal. Many times these are not young birds, but old ones just completing the molt. Disuse of the vocal muscles, or change due to the molt may account for these first unsuccessful attempts at song renewal.

TWO KINDS OF SONG.

We shall not proceed far in our study of Warbler songs before we are greeted with surprises. We shall find that all of the individuals of a species do not sing alike, and that the same individual is not always confined to one style of song. Sometimes the variations may be considerable, sometimes scarcely worth noting. We shall not proceed far in our study of these variations before we may be greeted to a fresh surprise in the form of a song wholly different from anything before heard from the bird, which cannot be forced under the designation 'variation.' It is something apart from the ordinary utterance, both in quality and quantity. The manner of utterance strongly suggests that this is a passion song. We are now forced to distinguish between what we have before considered the song of the species and this newly discovered song. For convenience the first one may be designated the

CALL SONG.

What do we mean by Call Song? It is the song which we hear commonly: the song of every day, uttered under no special stress of circumstances, as a sort of accompaniment to the usual activities. It is an announcement to all other birds within hearing, of the singer's whereabouts. It becomes a distinct mate call when the breeding grounds have been reached, if it could not be so considered before. After mating and the selection of the nest site it becomes an announcement of ownership and a warning to all trespassers. During

mating it is often a challenge or cry of defiance, and may sometimes become the battle cry when the fight is on. With some, possibly many, species it is used during courting as a love song, when it may be somewhat modified, thus approaching the passion song. It is always an announcement of some sort to some other birds, and may, therefore, be properly termed a call song. Not usually being reserved exclusively for the mate nor for himself, it might also be designated the altruistic song, as distinct from the egoistic or

PASSION SONG.

What, then, is the Passion Song? It is an outburst of melody of such richness and fullness, such thrilling ecstasy, that the singer is lifted into the air on quivering wings to pour out his melody without a pause until the inspiration has passed. The call song is the product of a deliberate purpose, but the passion song wants no purpose. It bursts forth unbidden. We have supposed that the passion song is purely a love song, intended only for the mate, since it is usually uttered only in seclusion and at times when vulgar ears are not supposed to be listening. There is little doubt that during the mating and nesting season it is a love song, but I have repeatedly heard the song of Oven-bird long after the young had left the nest and were no longer dependent upon their parents. I venture the suggestion that this song is induced by an overflow of energy which finds expression in this way. It is a sort of hymn of praise for the mere privilege of life. It is so far different in execution from the call song that there is no ground of comparison. The performance is a continuous thrilling warble with no plan nor suggestion of pause, accompanied by fluttering flight or swift dartings about an open space in the woods. The favorite time is just as twilight begins to cast its hush over nature; but it may be heard in the morning twilight, or sometimes during a dark, damp day when there are twilight conditions. Once I heard it from an Oven-bird on the approach of a thunder storm about nine in the morning. While the song is so unlike the call song, it may be a medley of the notes of that song, or begin with a few notes of the call song and close with a complete rendering of it.

I doubt if a hard and fast line can be drawn between the two styles of song, and I question if even now there are not some species whose call songs are not growing toward the passion song. Certainly some show a tendency in that direction, both in the modification of the notes of the song and the manner of utterance at stated times or under peculiarly favorable conditions. Some species manifestly employ the call song for love making without much modification. When the song is given during the chase after the female it is uttered in the throat or only faintly warbled by many species, as tho the attention could not be divided between the flight and the song, each needing it all.

The writer knows of only a dozen species who have a fairly distinct passion song. Preeminent among these stands the Oven-bird, so often mentioned above. It is not likely that these are all that sing so, since nearly every year hitherto has seen the list swelled. I would not be bold enough to say that all Warblers sing a passion song that is unlike the call song, but there can be little doubt that more than this dozen should be found to.

VARIABILITY IN THE CALL SONG.

To the most of us a Yellow Warbler is a Yellow Warbler be he number one or number one thousand in the list of individuals. We recognize no difference in the different individuals of a species in any limited region where we study. And it is true that the individual differences of color pattern, while sufficiently unlike to make a mistake among the birds themselves as to which is their mate unlikely, are practically alike to us. But it is not so universally true with the songs. A singer is not confined to one style of utterance, even under like conditions. I mean many species are not, possibly all. But some are far more variable than others. A common variation lies in shortening or lengthening the usual song by dropping or adding syllables. Another common method is the change of position of syllables that are somewhat different, or a change of accent. Sometimes a single syllabled song may become double syllabled, or vice versa. The closing cadence may either rise or fall at the pleasure of the singer. But these variations do not much affect the character of the song, nor

make it difficult to identify to any but the one who is hearing it for the first time. Another variation often indulged in by some of the more versatile singers is the substitution of one vowel sound for another. When this is accompanied with the variations noted above there may be some difficulty at first, but when the *style* of utterance is once learned variations are not deceptive, but rather pleasing for their variety. Each species has a style all his own which can be relied upon in any given locality, however variable his song may be.

There seems good evidence that there is also a seasonal variation, or a migratory variation. Some birds sing one style of song when they start from their winter homes for the north, another during the latter part of their journey, and still another when they are well settled for the summer. How universal this is I am unable to say. With some species the difference between the songs is decided, in others much less so. It would be interesting to know whether nesting birds of one species sing the same in all localities where they nest, or whether there is variation of much consequence. My own notes show only that with the few species which nest in Lorain county, Ohio, the songs of the birds which remain are somewhat different from the songs of those that pass further north. Do the Ontario nesting birds sing like the Ohio nesting ones? Probably.

Is there a longitudinal variation as well as a latitudinal one? If any probably far less marked. With some other species, notably the Dickcissel, there is a marked difference between the singing of the Iowa and the northern Ohio birds. If there is such a difference among the Warblers the notes at hand give no evidence of it. We might naturally look for some variability in the sub-species, growing into recognizable permanent differences, since they are variations in other respects from the species. But we might argue from this that since genera are assemblages of species which in some prehistoric time evolved from a common stock by differentiation, that therefore the songs of all the members of a genus should bear a closer resemblance to each other than to those of any other genus. Either this is not true, as we shall see, or else the present system of classification is wholly wrong; an unlikely supposition. Often species of widely separated genera resem-

ble each other more than species of the same genus. But it must be said that the closest resemblances anywhere found do lie within the genus, and between the species which are placed side by side in classification. An artificial key to the songs would therefore group the species as unnaturally structurally as an artificial key to their colors. But let us defer further discussion of variability until the study of the several species again brings it into prominence.

We have become somewhat biased, I am afraid, in our opinion that among the birds song belongs only to the males. In large measure that is undoubtedly true, but it is not universally true. The female Redstart sings at least one of the variations of the male, and I have heard a feeble song from the female Maryland Yellow-throat. The female Audobon's Warbler is said to sing. I have suspected the female Yellow-Warbler and the female Oven-bird of it.

DIFFICULTIES, AND METHOD OF PRESENTATION.

THE difficulties which one who attempts a description of the songs of the Warblers meets at the outset seem almost unsurmountable. First of all is the 'personal equation' of the describer as well as the 'personal equation' of the one for whom the description is attempted. This may be minimized by combining notes from many describers, thus securing a sort of Volapuk description, which will really be a generalized song possibly suggestive to most persons already familiar with the song, but practically useless to the novice. The writer's practice, where there is considerable difference in the descriptions, is to combine those that are alike into a type, and then illustrate each type. Where this is not done practical agreement may be assumed.

Another difficulty lies in the variability of individual birds composing the species. Without such variability there would be no progress of the species toward a more perfectly developed song. But the variation here is less of a hindrance to the intelligent understanding of a description than the difficulty stated above. Indeed, I am not sure but this difficulty is a blessing in disguise, for some one of the variations may fit the description for the learner, where an unvariable one would utterly fail.

The one great difficulty lies in the almost entire lack, among human signs and symbols, of anything to even approximately represent birds' voices. We can only suggest with the means at hand. Our systems of musical notation are wholly artificial and mechanical, theirs wholly natural and unhampered. Our ears have become so accustomed to certain fixed intervals in the chromatic scale that we are prone to regard them as absolute necessities to any sort of melody. But if that be not true, there yet remains the entire lack of characters with which to represent the avian music in terms of human music. The learner's first need, then, is to become accustomed to bird music experimentally. It is not necessary to know what species is singing:

that will follow in good time. Equipped with the knowledge of what bird music is, the student can go on to a study of the characters common to the members of some group, this in turn followed by study of the individual species. It is not at all necessary to know the songs of many species of a group before the group type is learned. The songs of a half dozen or less will be enough.

To appreciate the realness of these difficulties one need only scan the pages of a few books wherein bird songs are described. Taking each description at its face value we should be compelled to believe that there is no constancy to a song-type within the species. But these diverse descriptions are often descriptions of the same individual bird, sometimes written by different persons at the same time standing side by side. It simply illustrates the first mentioned difficulty: that we see things differently, hear sounds differently, call up the same impression differently, are differently impressed by the same thing; and, of course, represent the same thing differently.

In view of this it would be time and effort wasted to attempt a description of the melody in the song of each species. Rather let the effort go into a representation of the more mechanical production of the song. The melody can be hinted in word description, and more or less of it will appear if the attempt be made to reproduce the song from the description given.

THE METHOD.

There are objections to any system of representation, because each, and even all taken together, are wholly inadequate, but some method must be employed. The system most widely used is the system of syllables. The birds do not speak syllables, but our minds seem to need something of the sort to fix upon as a suggestion of the sort of sound produced. We seem to associate high pitched, shrill sounds with the vowel *e*, low whistling sounds with *o*, or *a* as in *ah*; terminal sounds not too high pitched become *u*. Short, high-pitched sounds are like *i* in *it*. The chief objection to this system probably lies in the great diversity of the vowel sounds, making uncertain what sound is intended. This may be obviated in large measure by agreeing what sound each vowel shall always represent.

In this paper *a*, *e*, *o* and *u* are long, but *i* as in it. Double vowels represent a prolongation of the note which the syllable represents. The consonants have the sounds which their position necessitates. In addition to syllables, a system of dots and dashes, which I have found valuable in field work, is given where greater clearness seems to be gained by its use. The chromatic scale has not been used enough in the printed descriptions, nor in my own field work, to make its use here practicable. It would no doubt prove of great value if used for every species, furnishing means for fairly exact comparisons, but when employed only here and there and for but a few species the gain over arbitrary characters would be slight.

The method employed for presenting the subject differs from that usually employed. Instead of treating the species separately and in systematic order, it has seemed better to largely disregard the systematic arrangement for the sake of grouping the songs according to similarities exhibited in method of delivery, expression, or what not. Assuming an evolution of song, the order within the group is, so far as practicable, from the most primitive to the most specialized. But where a type has been taken, the order is from the ones most similar to those most dissimilar to the type. This leads us to speak briefly of the probable origin of bird song.

Mr. Charles A. Witchell, in his book, "The Evolution of Bird Song,"* says in substance, that voice probably grew out of grunts and hisses accidentally uttered during extreme fright or during combat. These became call notes by bringing to the aid of the one in distress those of his own kind as helpers. Call notes grew into call songs by the repetition of the simple call notes, modification naturally following to produce, in time, a song more or less different from the call note. And I may add, the call songs have grown into passion songs by a process of still further modification induced by an overflow of physical and perhaps mental vigor at certain seasons, no doubt emphasized by the migratory habit of the larger proportion of the class. We cannot stop to follow out the steps in the development of bird song here. Those who desire to do so should read the book above referred to.

*THE EVOLUTION OF BIRD-SONG; | With | Observations on the Influence of | Heredity
and Imitation. | By Charles A. Witchell. | London. | Adam and Charles Black. | 1896.

WARBLER SONGS.

THERE are, or were at the last count, fifty-seven species and sixteen subspecies of warblers accredited to North America north of Mexico. Of this number the writer has been able to find described more or less fully the songs of forty-six species, leaving eleven species yet to be studied. Of the subspecies it may be said that the songs are so similar to the songs of the species from which they have sprung that they are practically indistinguishable and so need not be counted in the final result. If there are exceptions I have been unable to find them.

These forty-six species (with their subspecies where any occur) can readily be divided according to the style of song, and the divisions subdivided, but it must be understood that this style of division plays havoc with the accepted systematic arrangement of the group. For convenience we may first distinguish two groups: Those with whistling songs; those with song otherwise. Treating the latter group first because it includes the more generalized species if not the more generalized types of song, the sub-group which seems naturally to stand first may be designated:

THIN, WIRY, HIGH PITCHED SONGS.

While this may seem an arbitrary and therefore unnatural group, it is convenient in bringing together songs which are readily over-looked amid the May medley of stronger voiced singers. If, as seems likely, this type of song is the more primitive one, the group is not an unnatural one.

Perhaps the only character strictly common to every member of the group as here constituted, is the high pitch of the song. Some songs are wiry, some insect-like, some thin without being wiry, but all are high in pitch—so high that some ears seem incapable of hearing them unless close at hand. But it does not follow that these songs are weak. On the contrary, some of them carry far, just as the shrilling of the cicada carries far.

Grouping within this group seems so impracticable that a treatment of the species separately in systematic order would appear more desirable.

Black and White Warbler. *Mniotilta varia.* 636.

The migrating song of this warbler is a thin, wiry sibilant of repeated single syllables, or a series of double syllables, ending, in both cases, with two shorter syllables. The one type is well represented by the syllables *tse tse tse te te*; the other by *ki-tse ki-tse ki-tse se se*. Not seldom the performance seems to consist of a series of closely connected syllables, like "che-a-wee-a-wee-a-wee" (Burns). The accent on the syllable "wee." In every double syllabled song the accent is on the second syllable.

Apparently the migrants sing but little and then fitfully. Some seasons none are heard singing at any time. It is one of the last warbler songs that most of us are likely to learn, unless the circumstances be more than usually favorable. According to Nuttall the latter, presumably the breeding, songs are decidedly mellowed and somewhat resemble some songs of Redstart.

During the migrations the birds are to be found in considerable numbers in almost any sort of woods, as well as in village and city parks and tree lined streets. They are not found west of the Plains, but are birds of the eastern United States.

Blue-winged Warbler. *Helminthophila pinus.* 641.

The ordinary call song of this species has a decided insect quality. He seems to inhale a shrill *zre-e-e-e-e* and immediately exhale a buzzing *zwe-e-e-e-e*, the whole performance comprising a perfect double run thru about half an octave of the scale. Often it seems to be a simple *zwe-e-e-e-e ze-e-e-e-e*, the latter part merely a sputter. At its best the song is a drowsy, locust-like shrill, belonging rather to mid-summer than to spring.

There is another song which is usually given during the early summer months, but which I have heard shortly after the arrival of the bird in the last days of April or the first days of May. This song is far more varied and has a far

better claim to be called a song. Mr. Chapman renders it *wee, chi-chi-chi-chi, chur, chee-chur*. Mr. Burns reports still another: *che-de-de-e, che-e-de-de, che-de-de-dee*, resembling the Chickadee some what. These songs may possibly stand for passion songs, since they are far sweeter and more powerful than the other; but they are not flight songs.

There are two definite song periods, the first beginning with the bird's arrival and ending about the middle of June, during which time the insect song is given almost entirely; the second one beginning late in July or early in August and continuing to the third week in August, this period being characterized by the more varied song, but not to the entire exclusion of the other.

The Blue-wing delights in the second growth bordering uncut woods, where the ground completely dries only in mid-summer. Here he perches on the topmost twig of some ambitious young sprout or high bush and sings his hours away. For his later song he seems to prefer a less conspicuous perch among the lower growth.

This is another eastern species, ranging west to Nebraska and Texas, and north to southern New England and Minnesota.

Parula Warbler. *Compsothlypis americana.* 648.

Parula's song is hardly wiry, but it is fine and delicate—more like hair than wire. The more delicate singers seem to say *pe-tse, pe-tse, pe see see*, with a slight accent on the second syllable of each phrase. A rendering less delicate and probably more commonly heard, Mr. Burns represents thus: *cher-re-re, cher-re-re, cher-re-re, and cher-er, cher-er, cher-er che-e-e-e*. This is heard often during the migrations. There is a tendency to an increase in volume to the end, the first notes being more softly uttered.

Mr. Bicknell recognizes two distinct songs. "In one, the notes coalesce into a fine insect trill; in the other, four similar notes are followed by four others, weaker and more quickly given."

It sings thruout its spring migration, and is sometimes heard during its return south. I have been unable to find any record of the time when its song closes at its breeding grounds.

Northern Parula Warbler. *Compsothlypis americana usnceæ.* 648a.

The remarks on song are here given under the specific form for the sake of uniformity, but they really apply to the sub-specific form. The Parula Warbler is the southern form, occurring in the south Atlantic and Gulf states, north in the interior to Mt. Carmel, Ill. ; the Northern Parula Warbler breeds along the norther tier of states and into Canada, and west to the plains. There is nothing to indicate that the songs of these two forms differ perceptibly.

Cape May Warbler. *Dendroica tigrina.* 650.

The lack of much definite information about the song of this warbler in the literature of bird songs, will attest the general rarity of the species. The only studied attempt at a description seems to be that of Prof. A. W. Butler in his Birds of Indiana. "*a-wit a-wit a-wit a-wit a-wit*, each pair of syllables repeated five times with moderate rapidity in the same tone, with no inflection." This description answers very well for the songs which I have heard if it be added that the effect is only less wiry than that of the Black and White Warbler. The birds sing on their northward journey but have not been reported on their return south among the singers.

I have found more individuals in orchards than anywhere else. The only ones seen in Lorain County, Ohio, to my knowledge, have been in the orchards within the village. But they are known to flock with other members of the family in the woods.

In the nesting haunts the male seems to delight in mounting to the top of a tall tree and there pouring out his song while the female broods over the eggs in a low bush at some distance, thus misleading the nest hunter.

Another eastern species, west to the plains and north to the Hudson Bay Territory.

Cerulean Warbler. *Dendroica rara.* 658

Six different writers agree in their descriptions of this bird's song. It consists of two distinct parts, the first of several definite single syllables with a comma pause between

each two, followed by a trilled syllable of about double the length of the first part. There is thus a marked resemblance to Parula's song. The syllables *tse, tse, tse, tse, te-e-e-e-e-e-e*, serve to recall it to mind. The song rolls up the scale quietly and evenly. The effect is less delicate than Parula's song, yet not more wiry. A larger song from a larger bird.

My notes indicate that this warbler sings from his arrival in the first week in May until the third week in May, and again during the last of June and first week of July. I have never heard it sing during the fall migrations and find no record of a song period then.

This is a bird of the interior of the United States between the Alleghanies and the Plains and north to Ontario.

SONGS OF STRIKING CHARACTER.

Under this heading are grouped those species in whose songs there is not only distinct individuality to so great a degree that resemblance to any other species is too faint to be considered, but in which there is a decidedly striking effect. It does not follow that the songs are loud, nor that they are always sharp and clear, but simply that they arrest the attention by reason of their individuality. Here, again, we are unable to arrange the group logically, so that we must fall back upon the systematic arrangement. First in order and probably also first in prominence is

Protonotary Warbler. *Prothonotaria citrea.* 697.

It is sufficient to say that *Prothonotaria* rings out a *peet, tsweet, tsweet, tsweet, tsweet, tsweet*, which sounds like the Solitary Sandpiper in the distance. One could hardly mistake it. It is high pitched, penetrating and startling. Mr. Nehrling calls him a fitful singer, but heard at all times of day and in all weathers. Mr. Nehrling also reports a passion song which is like the Oven-bird's passion song, reserved for select occasions only.

This is a water-loving species, frequenting low trees and bushes which hang over the water or which grow in swampy places. But there are many instances of more upland occurrence during the breeding season. In some regions at least,

the birds are familiar objects about the premises, and may also nest about bridges which are in constant use. Dr. Thomas S. Roberts has an interesting article in the July, 1899, *Auk*, in which he figures nests of this bird in a bridge over the Mississippi River opposite La Crescent, Minn.

I find no evidence of a second song period.

This Warbler is found over the eastern part of the country west to Kansas and Nebraska and north into Minnesota, breeding thruout its United States range.

Sennett's Warbler. *Compsothlypis nigrilora.* 649

The only note relating to the song of this Warbler that I have been able to discover is contributed by the discoverer, Mr. George B. Sennett. He says of it: "Its notes are so clear that they can be heard at a long distance, and are readily distinguishable from those of all other birds. There is thus a marked departure from the type of the other member of this genus.

In the United States this species is confined to the valley of the lower Rio Grande in Texas.

Black-throated Blue Warbler. *Dendroica carulescens.* 654.

This bird's versatility is one of his chief characteristics. And the college campus birds seem to be rather more musical and more versatile than those in the woods. Here, on the campus, in one season, I have recorded the following variations:

tu, euu euu eeee-e-e, soft at first, loud and rattling at the close.

chweu chweu chweu, uniform thruout.

chw' chw' chw' chwee, the last syllable strong and full.

two two two z-z-z-z-z (indistinct at first, gathering force
te zwee zwee zwee-e-e-e, (and closing high and shrill.

we we z-z-z-z-z, harsh and penetrating.

All writers agree that the song begins faintly, rapidly gathering force until the shrilling climax of the last syllable is reached. It is difficult to describe; but perfectly distinctive.

The spring migrants are with us for two or three weeks in May, singing during their stay, and returning in September when they rarely sing.

The birds love the underbrush in the woods, but remain well up in the trees on the campus where they associate with the other tree haunting species.

Another eastern species which ranges west to the plains and north to Labrador. The form which inhabits the higher Alleghanies has been described as

Cairns' Warbler. *Dendroica caerulescens cairnsi.* 654a.

The song and habits are likely identical with the species.

Golden-cheeked Warbler. *Dendroica chrysoparia.* 666.

This species is given this place on the strength of a statement that its song of 'tser, weasy-weasy-twea', bears a resemblance to the song of the next species. The song is described by Mr. Nehrling as composed of soft notes. It also suggests some of the variations of Redstart.

It is a Mexican species which crosses into south-western Texas.

Black-throated Green Warbler. *Dendroica virens.* 667.

While there is great diversity in the descriptions of this Warbler's song, there is clearly evident in all the descriptions the one peculiar type of song. No better illustration of the diversity in hearing and interpretation could be afforded than this list of syllable descriptions. The syllables which best describe the type song to me are: *pe, te, che-o, te,* or *pe, te, che-to, che.* The enunciation is clear cut and the effect very pleasing. It is an unique song. In musical notation it would stand something like this: Not seldom there is a double variation which might be represented thus: In every case the third and fourth syllables, and in the second case the fifth and sixth also are tied together, the others being staccato. It is the one Warbler song that students beginning the study of birds hear and heed.

During its stay, this Warbler is decidedly common on the college campus as well as in the woods. It also ranges the village streets—overhead.

The birds are usually with us for the first three weeks of May, singing during the whole time. They return again in

September, but I can find no evidence of another song period then.

The range is the same as the other eastern Warblers, reaching the Plains in the west and Hudson Bay Territory in the north.

Townsend's Warbler. *Dendroica townsendi.* 668.

Of this western species Mr. Merrill says: "The song is like *de, de, de-de, de*, all especially the first three notes, like Black-throated Green. It is different later in the season."

Western North America, east to central Colorado, north to Sitka, Alaska.

Prairie Warbler. *Dendroica discolor.* 673.

The remarkable quaintness of this Warbler's song cannot be suggested on paper, unless Dr. Coues has done so in his remark that it is "Like a mouse complaining of the tooth-ache." The notes seem to suggest *zee* syllables repeated six or seven times, deliberate at first, increasing to rapid at the close. It is perhaps sufficient to say that no one, not even the novice, could listen to the song without having his attention instantly riveted.

I find no notes regarding the length of its song period, nor as to whether it has a second song period.

The bird delights in thickets and brushy fields and pastures, or almost any treeless thicket.

It is another eastern species, ranging west to the Plains and north to Michigan and southern New England.

Macgillivray's Warbler. *Geothlypis tolmiei.* 680.

Rev. W. L. Dawson's description of this western species' song seems to fit the case, *sheep, sheep, sheep, shear, shear, sheep*, or *sheep, sheep, sheep, sheep, shear, sheep*, bearing a good resemblance to the song of Dickcissel.

It is a bird of the western United States, from the eastern foot hills of the Rockies to the Pacific coast, and north into British Columbia.

Hooded Warbler. *Wilsonia mitrata.* 685.

Mrs. Wright represents this Warbler's song thus: *che-*

wco-tsip, tsip, che-we-co. While Mr. Chapman makes the bird say, "You must come to the woods or you won't see me." Rev. J. H. Langille recognizes a day song, *che-rec-cherrec, chi-di-ee*; and a twilight song, *whe-rec-whee-rec-eeh*. The first three syllables of the day song are loud and bell-like, the next two uttered rapidly, the last with falling inflection.

According to Mr. Bicknell, the first song period closes late in June or rarely as late as early in July, the second during the fourth week in August. He recognizes the two sorts of song which seem to be of the nature of individual variation rather than two distinct sorts.

Eastern North America, west to the Plains, north and east to southern Michigan, southern Ontario, western and southeastern New York, and southern New England. Breeds from the Gulf of Mexico northward.

SONGS RESEMBLING THAT OF CHIPPING SPARROW (AND JUNCO).

The common character of this group is the trilling. Some of the songs are decidedly shrill and almost wiry, but lack the distinctive characters of the first group. Some are fairly round and full, but could not properly be designated whistles. Some are somewhat striking in character, but all are distinctly trilled. It must not be understood that the songs necessarily bear a close resemblance to the monotonous trill of the Chipping Sparrow because that species has been used as a comparison, but simply that the sparrow is the bird most likely to be most generally known. The order adopted in this group will be from the closer to the less close resemblance to the song of Chipping Sparrow, which is a trill or twitter of successive chipping syllables, monotonous, high pitched and weak in utterance.

Worm-eating Warbler. *Helminthorus vermicorus.* 639.

Song of the Chippy quality, but weaker, and bearing some resemblance to that of Junco. Mr. Burns describes a song that resembles that of Goldfinch: *chat-ah-che-che chee-chee-chee*, which seems to correspond well with a passion song in the manner of utterance.

The favorite resort of this bird is a dry, wooded, moderately rough region, where the brushy hillsides and ravines furnish a cover. He sometimes ventures into the open also.

This Warbler sings from his arrival in early May until the end of the first week, rarely into the second week, of July. Mr. Bicknell records a second song period during the latter part of August.

Eastern United States, west to Nebraska, north to southern New York and New England. Breeds throughout its United States range.

Bachman's Warbler. *Helminthophila bachmanii*. 640.

According to Mr. O. Widmann, this Warbler, the Worm-eating, Junco and Chipping Sparrow sing remarkably alike. But the song of Bachman's Warbler is shriller than that of Chippy instead of being weaker. There is a little unconfirmed evidence that it also has a passion song. Mr. Brewster describes the migrating song as resembling that of Parula Warbler.

I find no evidence of a second song period.

While migrating it keeps well to the treetops, but Mr. Widmann found the breeding birds in the St. Francis region of Missouri singing in the trees perched rarely higher than forty feet. His paper on the finding of the first nest of this species, in the *Auk*, Vol. XIV, page 305 to 309, is an admirable account of the habits of the birds.

Hitherto Bachman's Warbler has been assigned to the south Atlantic States (southern Virginia and Florida) and westward to Louisiana, but Mr. O. Widmann's labors have extended its range into south-eastern Missouri.

Golden-winged Warbler. *Helminthophila chrysoptera*.

642.

The monotonous is emphasized in this bird's song by its being lazily and drawlingly uttered. It is an unmusical song. Mr. Samuels has described it: *zee-zee-zee-zee-zee*.

There seems to be nothing relating to the length of the song period, nor whether there may be a second one.

The bird haunts the scrubby second-growth, or even the

borders of dense woods, but when singing prefers the tops of the taller trees.

Eastern United States, north to southern New England, southwestern Ontario, and southern Minnesota, breeding only in the northern parts of its range.

Tennessee Warbler. *Helminthophila peregrina.* 647.

The song would be scarcely distinguishable from that of Chippy but for the first two syllables, They are not the ordinary "chip," but more like "twip." There is also a tendency to acceleration and increase in volume as the song proceeds, in this also being unlike Chippy.

It arrives during the first week in May and tarries well into the third week, singing during its stay. There is no second song period on its return, about the middle of September.

My experience indicates that this Warbler is far more common in orchards than anywhere else, particularly orchards in the middle of village blocks. Comparatively few are met with in woods. Others, however, in other places, find him commonly in the woods with other Warblers.

Eastern North America, north to Hudson Bay Territory, breeding in the northern parts of New York and New England northward.

Hermit Warbler. *Dendroica occidentalis.* 669.

The song is a penetrating twitter, harsher and more run together than that of Chippy. Mr. Chester Barlow describes the song thus: *tsit tsit tsit tsit chee chee chee*, the first four syllables gradual and of uniform speed, ending quickly with *chee chee chee*.

There is no mention of the length of the song period, nor of a second one.

This species ranges from the Rocky Mountains to the Pacific coast and from Washington southward.

Pine Warbler. *Dendroica vigorsii.* 671.

Mr. Chapman says of the song of this Warbler, that the southern ones sing like Field Sparrow, but the northern ones like Chippy. I have heard but one sing, and his song

closely resembled the song of Chippy, but was higher pitched and more deliberate.

The birds probably sing during their stay in the migrations, but I find no record of a renewal of song on the southward journey.

Eastern United States, west to the Plains, north to Manitoba, Ontario and New Brunswick.

Palm Warbler. *Dendroica palmarum.* 672.

The trill remains as a prominent feature, but the note is no longer a true chip. Better *tsee tsee tsee tsee*, with a distinct swell. Each syllable should be given a half double utterance except at the middle of the swell, where the greater effort seems to completely coalesce the half double quality into one distinct syllable. There is a little similarity to the song of Myrtle Warbler, but lacking the liquid quality of that species.

The Palm Warbler arrives late in April and tarries well into the third week of May, singing fitfully the while. He returns again in the second week of September, but does not sing.

The Spring setting for this Warbler is a low, damp or wet woods with a profusion of undergrowth.

This specific form occupies the interior of the United States, north to Great Slave Lake. Rare in the south Atlantic States during the migrations. While the

Yellow Palm Warbler. *Dendroica palmarum
hypochrysea.* 672a.

Occupies the Atlantic States, north to Hudson Bay. This sub-species, from all I can learn, does not differ in song from the species.

Myrtle Warbler. *Dendroica coronata.* 655.

There is some variation in utterance with this species, but the general effect is a trill or twitter, therefore bearing a closer resemblance to the Chippy than to any other group. The syllable *tsaw* repeated several times gives a fair idea of the quality.

The Myrtle Warbler is with us from the third week in April until the third week in May, singing constantly; and

again throughout October, when no song has been heard nor reported.

Except when Myrtle bushes entice him away, the Myrtle Warbler keeps well to the higher woods during the vernal migration, but seems just as partial to fields during the return.

This is a bird of North America, chiefly east of the Rocky Mountains, breeding from the northern United States northward. A Pacific coast form has been described as

Hoover's Warbler. *Dendroica coronata hooveri*. 655a.

Audubon's Warbler. *Dendroica auduboni*. 656.

Dr. Coues states that the song of this species closely resembles the song of Myrtle. Without describing it Mr. Merrill states that the male has two distinct songs, and that the female sings.

The species replaces the preceding one west of the Rockies, north to British Columbia. It is accidental east to the Atlantic coast.

Black-poll Warbler. *Dendroica striata*. 661.

In execution the song resembles that of the Myrtle—all in the same pith and containing a perfect swell, but sounds more like "striking two pebbles together," therefore lacking the liquid quality of Myrtle. There are two renderings, the more musical one containing a prelude of three or four distinct notes, like *tsip tsip tsip*, followed by a twittering *tsee tsee te*. The other song is merely a twitter.

The Black-polls arrive late and make but a short stay, singing the while. They have no song period on the southward journey.

They remain well up in the trees, and seem rather partial to the woods to the almost entire exclusion of parks.

Nearly the whole of North America east of the Rockies, and to Alaska and Greenland. Breeding from northern United States northward.

SPECIES WHOSE SONGS RESEMBLE THAT OF YELLOW WARBLER.

Considered according to the manner of utterance this is a

fairly satisfactory group, and as to quality of tone there is evident correspondence, but beyond these it is an unsatisfactory arrangement. The four species which sing alike in many ways may perhaps be sub-grouped by themselves, leaving the remaining four in another sub-group.

This type of song has a marked singleness and earnestness of purpose which at once arrests attention. The song is not given as a sort of afterthought, or a thing of secondary importance, but it requires a pause in the other activities until the lay is finished. The syllables are clear cut, and the song has a distinct beginning and as distinct an end. It is complete in itself. The earnestness of utterance often becomes vibratory, approaching the passionate, yet distinctly non-passionate in style.

All of the songs are high pitched, but clear and smooth, just too high to be called a shrill whistle. They are simple songs, every one, yet with a distinct touch of sweetness that makes them pretty. Perhaps no better idea of the style of this song-type can be given than by a careful description of the song of the

Yellow Warbler. *Dendroica aestiva.* 652.

While there is no little variability there is little likelihood of confounding any of the variations with other species. Now it is *sweet sweet sweet sweet sweeter sweeter*, now *sweet sweet sweet sweetie*, again *wee-chee, we-chee, wee-i-u*; once more *wee-chee, chee, chee, chur-wee*. Over all presides the bird's distinct individuality. In all the variations I have heard the penultimate syllable is at a higher pitch, if the last phrase be three syllabled, lower if the last phrase be two syllabled. There is also a tendency to an increase in cadence to the last. The whole song is forcible and loud, but smooth and pleasing. It will be seen that in each variation there are two parts, though the last may be but a double syllable.

There is no second song period, because singing does not cease until the last of July or the first week in August. It should be remarked, however, that there is a marked decrease in singing after the middle of July, at least in northern Ohio. Sometimes individuals are heard singing after the middle of August for a few days.

This Warbler's haunts are even more distinctive than his song. He frequents brushy woods and low gardens which abound in small shrubs, and is a well known orchard singer. But his favorite nesting place is a swamp tangle of small trees, bushes, vines and weeds. He does not hide in the foliage while singing, as some others do, but mounts to the top of some conspicuous tree or bush and makes a business of it. He is not to be seen within the taller woods, but about its edge in the fringing brush.

In southern Arizona, western Texas and north-western Mexico this species is represented by

Sonora Yellow Warbler. *Dendroica aestiva*
sonorana. 652a.

And in the coast region of Alaska by

Alaskan Yellow Warbler. *Dendroica aestiva*
alaskensis. 652b.

Otherwise the true Yellow Warbler may be found in North America generally, breeding nearly throughout its range.

Chestnut-sided Warbler. *Dendroica pennsylvanica.* 658.

While the resemblance to the Yellow Warbler is certainly close in many respects, the song is distinctly weaker and usually shorter, uttered with less vehemence. Miss Ethel Dane Roberts' description is happy: "tsee tsee tsee, happy to meet you." To my ear the syllables *te te te we chu* are the most suggestive. But allowing just a little for poetical license in Miss Roberts' rendering, there is no difference at all. In both the next to the last syllable must be given a third higher than the others, which are all on the same pitch would suggest the same arrangement. The song is often shortened at either or both ends, but six syllables seem to be the limit. It is refreshing to find such uniformity of description among writers. Nowhere is there greater discrepancy than in the two descriptions given.

This Warbler arrives about the first of May and remains two or three weeks, singing during his stay. On his return in September he is silent.

The Chestnut-side also frequents brushy places, but more wooded ones where the brush forms an under-brush. He shuns swamps, for the most part, as well as villages, preferring the woods; yet he regularly visits the college campus—that Mecca of the Warbler host.

His range is eastern North America, west to the Plains, and north to Manitoba and southern Ontario, breeding in the northern part of the range.

American Redstart. *Scotophaga ruticilla.* 687.

In general tone and quality there is a strong resemblance to the Yellow, but the range of variation is greater, and the song distinctly belongs to the "ringing aisles" of the woods. The commoner utterance can be recalled by *che che che che-pa*, the last syllable abruptly falling and weakening. A soft, sweet song is like *wee-see, wee-see-wee*, with a suggestion, at least, of lower pitch for the last syllable. Mr. Chapman represents a strongly accented song by *ching ching chee, ser-wee, swee, swee-e-e-e*. The fundamental difference between this bird's song and that of the Yellow Warbler is that there is a tendency to acceleration in the Yellow, while there is always a retard in Redstart. But even more distinctive, the two are not found in the same situations. Redstart builds him a house within the woods, singing to the accompaniment of his own echo.

It is well known now that the female of this species sings at least the more simple of the variations. I have never heard her sing the *staccato* described by Mr. Chapman.

My observations all point to continuous song from the early May arrival well into August, but Mr. Bicknell has found that there may or may not be a period of silence in July, followed by a second song period in August.

The Redstart inhabits the whole of North America to Fort Simpson, west regularly to the Great Basin, irregularly to California. It breeds from the middle of the United States northward.

Magnolia Warbler. *Dendroica maculosa.* 657.

Here the song differs from Yellow Warbler in ending in a falling inflection and from the Redstart in having the first

part distinctly double syllabled. I am now speaking of the commoner songs. There is such great variation that one is at a loss how to make comparisons. During the few days of migration I have already distinguished five variations, while Mr. S. E. White, in the Auk, describes seven. Rev. J. H. Langille distinguished the three types for three stages of the migration northward. In the south the song is a soft *whee-cho, whee-cho, whee-cho, whee-cho*; in the north it is *chee-to, chee-to, chee-te-ee*; while the breeding song is *crce-e-e-e-e*.

To Mr. Galloway the song suggests a "twisted caterpillar."

Mr. White's seven variations are well worth reproducing here.

1. Three notes, followed by one lower: *che-weech che-weech che-o*.

2. Three sharp clear whistles with a strong sound, then a warble of three notes, the middle the highest, the latter clear cut and decisive: *pra pra pra r-e-oo*.

3. Two quick sharp notes, followed by a warble of three notes, the middle the highest; the warble is soft and slurred: *prut prut purreao*.

4. A soft falsetto warble, different in tone from any other bird song: *purra-e-whu-a*.

5. Of the same falsetto tone, uttered rapidly: *prut-ut-ut-ut-ut*.

6. A harsh note like, in miniature, the cry of a Jay: *d kay kay kay*.

7. A harsh *k-e-e-e-dl*, the last syllable higher by a shade, quick, and subordinated to the first part. The alarm is a sharp *zeek*.

These fully cover the five which I have heard. The first is distinctly like the Yellow Warbler.

This species sings during its stay in spring, but I find nothing to indicate that it sings on its return journey.

The species inhabits the spruce and hemlock woods when breeding, but in the migrations it is found in any woods, and not seldom in village parks.

Eastern North America, west to the base of the Rocky Mountains and north to Hudson Bay Territory, breeding mostly north of the United States.

The remaining four species may be regarded as forming a transition to the Chipping Sparrow Group, the transition being most marked in the last species to be described under this heading. Yet it must be borne in mind that these species in no small sense belong to this group, all of them, rather than to the other one.

Canadian Warbler. *Wilsonia canadensis.* 686.

Without being very marked, there is a certain similarity to Yellow Warbler. The pitch is higher, lending a shrill effect, the song averages shorter, or if longer there is a distinct swell or small run, before the end instead of at the end. -- -- --
 --- -- -- might serve to represent it. Or --- --- --- The syllables I have written are *tu tu tswe tu tu*, the long syllable being higher pitched. Retaining this general character, the song may be lengthened or shortened. Mr. Thompson's *rup-it-chee, rup-it-chee, rup-it-chit-it-lit* must be a variation of rendering which I have never heard. The style of utterance suggests both the Yellow Warbler and Goldfinch.

The birds keep well to the trees, but are common on the college campus as well as in the woods. They seem to rather prefer the smaller growths.

Singing during its stay in spring, but silent in fall.

Eastern North America, west to the Plains and north to Newfoundland and Lake Winnipeg.

Orange-crowned Warbler. *Helminthophila celata.* 646.

The song is full and strong, not very high pitched, and ends abruptly on a rising scale. My note book renders it *chee chee chee chw' chw'*. The first three syllables rapidly uttered, the last two more slowly. One heard late in the season sang more nearly like Mr. Thompson's description: *chip-e, chip-e, chip-e, chip-e, chip-e*, but with the first vowel changed to *e*, thus eliminating what would appear to be a marked similiaity to the song of Chippy. Even in this song the ending is retained.

The Orange-crown sings while migrating northward, but I find no evidence of any song during the southward movement.

One must look for this bird in the bushes fringing woods,

or in the dense undergrowth of woods, where he conceals himself when singing.

Eastern North America, breeding as far north as the Yukon and Mackenzie River districts. Rare east of the Alleghanies, north of Virginia.

In the western United States, from the Rocky Mountains to the Pacific, the species is represented by the

Lutescent Warbler. *Helminthophila celata*
lutescens. 646a.

And on San Clemente, Santa Cruz, and Santa Rosa Islands, California, by the

Dusky Warbler. *Helminthophila celata sordida.* 646b.

Wilson's Warbler. *Wilsonia pusilla.* 685.

There is a variability in this Warbler's song which lies wholly within the group. Miss Roberts has summed it up in the following sentence: "It is sometimes like the ordinary song of Yellow, sometimes more like Redstart, sometimes almost unaccented." But it is always shriller than either, besides showing a tendency to marked *z* sounds. Mr. Nuttall describes it by the syllables *ts tsh tshea*, which strongly suggest a short song of Yellow Warbler. It is a small song, both in volume and quantity.

This black-capped Warbler sings during his northward journey, and I have heard weak songs on its return in autumn.

Brushy underwood is its favorite haunt, occasionally going higher up in the trees. It seems partial to places near water.

Eastern North America, west to and including the Rocky Mountains, north to Labrador, Hudson Bay Territory and Alaska. Breeds north of the United States chiefly.

From the Great Basin to the Pacific and north to Alaska the form is

Pileolated Warbler. *Wilsonia pusilla pileolata.* 685a.

Nashville Warbler. *Helminthophila rubricapilla.* 645.

There is considerable variation in execution of the song,

some renderings approach closely to the song of Yellow Warbler, while others resemble Chipping Sparrow. This is the pivotal species of the transition from one group to the other. Those which resemble the Yellow Warbler type are halting and less rotund. Mr. Minot represents this type by the syllables *wee-see, we-see, wit-a-wit-a-wit*. Rev. J. H. Langille by *ke-tse, ke-tse, ke-tse; chip-ee-chip-ee-chip-ee-chip*, which satisfies my ear better. Mr. Galloway also well represents it by *ka-cheepa cheepa cheepa cheepa, pichepe chip*; the transition syllable from the first to the second part of the song is admirable. The more Chippy-ward song may be represented thus: *k-chip; k-chip; k-chip; chc-chc-chc-chc*. The manner of utterance is also transitional, but the whole song is on the same pitch.

The Nashville spends little more than the first two weeks of May with us, singing constantly, but on his return he is silent.

I have found this Warbler everywhere that trees are growing, but rather more numerous in moderately brushy woods than elsewhere. There he ranges rather low, but spends much time in the trees.

Eastern North America, west to the Plains, north to the Fur Countries.

West of the Rocky Mountains it becomes

Calaveras Warbler. *Helminthophila rubricapilla gutturalis*. 645a.

WHISTLING SONGS.

Of the Whistling songs little need be said in general, except to define what we mean by whistling. True, there are a good many different kinds of whistles. Well, this is none of them. You make it yourself: pucker your lips and blow! That's the kind! The types selected are the Cardinal and the *pe-tee* whistle of Chickadee. Here, again, we clearly recognize a few transition species which it seems best to place last.

The group is readily subdivided into two sub-groups: Yellow-breasted Chat, all others. Giving them this order, we may first treat

Yellow-breasted Chat. *Icteria virens.* 683.

The song of the Chat is unique, not merely in this group, but in the whole class of birds. It is ventriloquial to a marked degree, but it possesses a timbre all its own. It would be far more proper to call the Chat's a performance rather than a song. To the uninitiated he appears to imitate every other sort of bird in the woodland, from the Crow and hawk to the sparrows; but to one familiar with him the Chat appears in it all. The imitation is not perfect, but approximate. Mr. Burns gives the best syllabled description of the describable part of the performance that I have seen: *cop! chick! cock! chack! co-co-co-co-co.*, the first softly, second, third and fourth emphatically, the remainder loudly and rapidly. There is usually a considerable pause between each of the first four syllables. There is endless variation in the performance, but these syllables are conspicuous and form a large part of the so-called song proper. While the Chat's range of imitation embraces nearly every voice of the woodland, he does not attempt an elaborate imitation, but rather snatches here and there from such parts as best suit his purpose.

The "flight song" of this species is apparently not a passion song at all, but rather comparable to the broken wing tactics of so many birds, or to the pitiful undone flutter of Killdeer, since danger seems necessary to call it forth. You have been cautiously searching hither and yon for a bird that ought to be attached to that voice, but all in vain, when you suddenly become aware of a loose bundle of feathers apparently suspended in the air above you, jerking like a witch and gradually settling down; while the air seems filled with a most bewildering medley of every sort of bird voice. You are too near his nest.

While performing, the bird remains well concealed high up in the foliage of some small tree, or in a thicket, but he will unmask if approached unawares. He is wary and alert. His favorite haunts are the brushy thickets bordering woods, or brier thickets with a few small trees.

He is one of the few night singers, singing at all hours of the night, but less frequently from twelve to two. It is no dreamy performance, but a wide-a-wake intentional song that rings and rings again on the still air.

He is singing when he arrives in the first week in May, and does not cease until the last of July or first of August. He has no second song period.

This species occupies nearly the whole of the United States to Ontario and southern New England, west to the Plains; west of the Plains to the Pacific it becomes

Long-tailed Chat. *Icteria virens longicauda.* 683a.

The remainder of the group need not be definitely subdivided. The transition species will be mentioned when they are treated. For lack of any evident logical order, we may begin with the best known species.

Oven-bird. *Sciurus aurocapillus.* 674.

The well-known double syllabled cry of this bird would scarcely need more than mention were it not that there is honest difference of opinion regarding the place of accent. As Mr. Chapman has well said: "It is a long, ringing crescendo chant, to which Mr. Burrough's description of 'teacher, teacher, TEACHER, TEACHER, TEACHER,' is so applicable that no one would think of describing it in any other way." The accent must evidently be upon the first syllable. The birds that I have heard have persisted in accenting the second syllable, the first one being weak and short: *p'*-CHEE. But this difference is rather technical than fundamental, since any one could readily identify the bird by Mr. Burrough's description. The description of the passion song will be deferred so that the "Water Thrushes" may be treated together.

The birds arrive very near the first of May, usually many together, and are singing. They sing well into the middle of July, but after the third week of June there is a marked waning. Song is resumed, but less vehemently, in August, usually ceasing before its close. Very few songs are full and strong during this second period.

The accompaniment of the Oven-bird's chant is a high, damp to wet woods where the upturned roots of fallen trees leave hollows for little ponds to form.

North America east of the Plains, north to Hudson Bay Territory. The breeding range extends from Kansas, the Ohio Valley and Virginia northward.

Water-Thrush. *Sciurus noveboracensis.* 675.

I shall not soon forget the anxious days and nights that this water sprite caused me before I could rightly say that I had seen him singing. The song was burned into my memory: *sweet sweet sweet chu-chu-wee-chu.* The first three syllables strongly accented and staccato, the last four short and run together into one phrase, the next to the last a third or more higher. Occasionally one sang *to to che-we che-we che.* The first two indistinct, the third, fifth and last strongly accented and a sixth higher, the fourth and sixth a little lower than these. Both songs are high pitched, clear, liquid whistles that carry far.

The Water-Thrush comes to northern Ohio near the first of May, and sings during his stay of three weeks. On his return early in September he is singing as vigorously as when he departed, for aught I can tell.

I have heard the song only in wet brushy places, preferably low woods or brushy clearings. The bird has sometimes been seen in wooded uplands. One regularly visits a wet tangle well within the village of Oberlin.

From Illinois eastward, north to Arctic America. From Illinois west to the Pacific coast the form becomes

Grinnell's Water-Thrush. *Sciurus noveboracensis notabilis.* 675a.**Louisiana Water-Thrush.** *Sciurus motacilla.* 676.

The ordinary song is, to my ear, a series of double syllabled, clear, ringing whistles, followed by a soliloquizing twitter. It is a thrilling burst that is startling and wild. The proper accompaniment is a wild, wooded glen in which a stream tumbles over its rocky bed.

Like the Water-Thrush, this species has two song periods, the first closing late in June or early July, the second beginning early in August. I have heard the passion song in August also.

West to the Plains, north to southern Michigan and southern New England, casually to Lake George.

The passion song of the water thrushes are so much alike that a description of one will serve for all. There is in each

the same ringing ecstasy of joy. The song seems to swing once round a great circle with incredible swiftness but perfect ease, ending in a bubbling *dimiducendo* as the performer lightly touches the perch or ground with half rigid wings held high. The song is a flight song, usually occupying less than half a minute, but packed with the intense life of the bird. I have seen the Oven-bird suddenly vault into the air, mounting to the tree tops on quivering wings, then dart back and forth in a zigzag course swift as an arrow, and finally burst into a song as he floated gently down. There is some difference in the passion songs of the three species, which seems to be in the use of some notes of the ordinary song at the close, rarely at the beginning. Sometimes the Oven-bird closes his passion song with a burst of the perfect call song.

It seems hardly fair to say that the songs of the Water-Thrushes are thrush-like, since there is almost nothing of the true thrush timbre to their songs. On the contrary, a careful analysis discloses, rather, a true Warbler timbre, obscured as it is.

Swainson's Warbler. *Helinaia swainsonii*. 638.

Mr. O. Widmann, who has probably given the breeding song of this Warbler more careful study than any other person, says of it: "It begins like the Water-Thrush and closes like the Louisiana Water-thrush." Mr. Wm. Brewster describes the song as "A series of clear ringing whistles, the first four uttered rather slowly and on the same key, the remaining five or six more rapidly and in a descending scale." He also says that in general effect it resembles the song of Water-Thrush. The Warbler is not a regular singer, according to Mr. Widmann, but seems to wait for an inspiration, and when it comes he must needs deliver his message.

I can find nothing definite concerning the song period, nor as to whether there may be a renewal in the fall.

The haunts of this bird are the vast swamp tracts of the southern states, as far north at least as the southern-most counties of eastern Missouri, where Mr. Widmann found it nesting. It apparently ranges to south-western Indiana and west to Texas.

Mourning Warbler. *Geothlypis philadelphia.* 679.

In quality and style this Warbler's songs bears a strong resemblance to that of Water-Thrush, the variations having the same general quality, but the song is considerably less in volume and lacks the wild thrill of the Water-Thrush. The song which I have heard most frequently is *tee te-o te-o te-o tee-se*, the last couplet accented and much higher pitched. A less common form slightly resembles the *crescendo* chant of Oven-bird, but is weaker. It is rather a swell than a *crescendo*. Dr. Merriam describes a variation which I have never heard: *true true true true too*, the last and next to the last syllables with falling inflection and more softly. The song is clear and whistling.

Song is incessant during the northward movement, but there is apparently none on the return journey.

This Warbler frequents low brush thickets in rather damp places, and appears to be solitary in its habits when migrating.

West to the Plains, north into Canada, breeding from the northern states northward.

Olive Warbler. *Dendroica olivacea.* 651.

Very little seems to have been written of the song of this Warbler. From that little one would be led to expect a high pitched, melodious, liquid, whistling song, on a descending scale; the separate notes not unlike the first note in the Whippoorwill's lay; possibly resembling the last cadence of Swainson's Warbler.

The Olive Warbler lives in the highlands of Guatemala and Mexico, north into southern New Mexico and to Mt. Graham, Arizona.

The songs of the next three species bear a resemblance to the clear whistles of Carolina Wren; but the resemblance is rather in the quality of the whistle than in the manner of utterance.

Yellow-throated Warbler. *Dendroica dominica.* 663.

This song seems to resemble that of Indigo Bunting as well as Carolina Wren, but it is wilder and more ringing than

the Indigo. Mr. Brewster describes it thus: *tawsee-tawsee-tawsee-see*, the last two rising and terminating abruptly. I find no mention of a song period in fall. The song has a certain ventriloquial quality.

The birds frequent the tops of trees bordering streams, moving about rather leisurely for warblers.

This species is confined to the southern United States, north to southern Maryland and Virginia, rarely to southern New England. The sub-species

Sycamore Warbler. *Dendroica dominica albilora.* 663a.

Is the form which inhabits the Mississippi Valley from western North Carolina to the Plains, north to southern Michigan.

The described songs seem to be practically identical with those of the species. Prof. A. W. Butler gives the fullest description: *twit, che-e, che-e, che-e, che-e, che-a*, the first abrupt with rising inflection, the next four following after a pause, all on the same pitch, the last rising sharply. While the syllables are different the description is almost exactly as above.

As the name indicates, this Warbler is most at home among the upper branches of sycamore trees which fringe the streams. His untiring activity makes study tantalizing.

Kirtland's Warbler. *Dendroica kirtlandi.* 670.

The song of this rare Warbler shows a marked tendency toward the Maryland Yellow-throat type, with a full oriole-like quality, "in marked contrast to the high notes of many warblers." It also resembles the song of the Yellow-throated Warbler. There are no syllable descriptions.

The rarity of this Warbler makes his geographical distribution somewhat uncertain. But he seems to be one of the warblers of the eastern part of North America, west at least into Illinois and Wisconsin, and east to Washington, D. C. He probably breeds north of the United States

Kentucky Warbler. *Dendroica formosa.* 677.

The song of this species is probably more like the whistle of the Carolina Wren than any other Warbler. Mr. Burns has

studied the song so carefully that he is fully qualified to speak for his locality at least. He has clearly distinguished a type for the earlier migrants and another for such as remain to breed. The migration type is: *peer-ry peer-ry peer-ry peer-ry peer-ry*, often *chee chee chee pere-ey pere-ey pere-ey*. The breeding song is: *too-dle too-dle too-dle too-dle*. The style of delivery is Cardinal-like, but weaker and finer in tone. The song carries far, ringing thru the woods. The bird seems to prefer to sing while perched, and rarely if ever does so while feeding.

One must look for this Warbler in rather densely grown wet or well watered woods, more often on the ground than in the trees. He is one of the Warblers that walk.

Mr. Burns states that the song period ceases about the middle of July (17 in 1899), and no mention is made of renewal of song later.

West to the Plains, north to southern Michigan. Breeds from the Gulf states northward.

This properly closes the group of true whistlers. While the species which follow are transational they are more closely allied to those which precede than to any others. They are strong-voiced birds whose songs possess a carrying power second only to the preceding species, and exceeding some of them. The most familiar one is

Maryland Yellow-throat. *Geothlypis trichas*. 681.

The call song is a repetition of three or four syllabled phrases, one of the syllables strongly accented. Sometimes the accent is on one, sometimes on another syllable. The variation is neither individual nor seasonal, as any one may readily prove by listening to an individual sing for half an hour. The song is well represented by the syllables commonly used to describe it: *wichity, wichity, wichity*, or *wec-che-te*, for the three-syllabled song, and *wec-te-chee-te* or *wec-tec-sce-tec*, for the four-syllabled. In every three-syllabled song that I have heard the accent has been on the first syllable. In the four-syllabled it may be on either of the four, at the pleasure of the performer. The accented syllable has the appearance of being longer than the others, and it is often on a higher pitch. Not infrequently the third and fourth syllables

are raised in pitch more or less, in which case the accent is likely to be spread over both, the third taking rather more of it. The song usually increases in volume as it proceeds.

The tone is shrill, but loud and clear, and closely approaches a whistle, but having a suggestion of the Warbler hiss. The bird throws his whole being into the utterance. His perch is usually elevated somewhat above the surrounding brush, while singing, but is seldom on the topmost twig.

This species has a passion flight song which is delivered much after the fashion of the Oven-bird, and is not unlike it in being a medley of its call song notes.

The Maryland Yellow-throat arrives singing with the host of warblers in late April or early May, and sings well toward August. After about a month's rest he resumes the song, but ceases again about mid-September. Rarely one may hear the song all summer long. Mr. Bicknell regards the September singing rare, but my record of four years shows no late August singing, but always early in September full songs.

The specific form is confined to the region east of the Mississippi River and south of Hudson Bay and Labrador. From the Mississippi Valley to the Cascade Mountains it becomes

Western Yellow-throat. *Geothlypis trichas occidentalis*. 681a.

And from Florida to southern Georgia the

Florida Yellow-throat. *Geothlypis trichas ignota*. 681b.

The Pacific coast form is

Pacific Yellow-throat. *Geothlypis trichas arizela*. 681c.

It seems likely that the two south-western forms,

Belding's Yellow-throat. *Geothlypis beldingi*. 682.
which inhabits the southern part of Lower California, and

Rio Grande Yellow-throat. *Geothlypis poliocephala ralphi*. 682.1.

which is found in the lower Rio Grande Valley, are not

greatly unlike our eastern form in song. At any rate this is as good a place for them as could well be found.

Connecticut Warbler. *Geothlypis agilis.* 678.

In this song there is a mixture of Oven-bird and Maryland Yellow-throat, but the resemblance is no doubt closer to the latter. Mr. Thompson's *free-chapple free-chapple free-chapple-whoit* will recall it to some. Mr. Butler prefers the word "beecheer." Mr. Gault describes six variations which seem well worth repeating⁸ here.

1. *Wheat-a; wheat-a; wheat*, gradually increasing in volume to the last.
2. *Wheat, our winter wheat, or our winter wheat.*
3. *Chip chee-a-wee; chip chee-a-wee; chip chee-a-wee.*
4. *Wheat, winter wheat, winter wheat, winter wheat.*
5. *Wheat here*, and sometimes only *wheat*: this on bright moon-light nights.
6. *Wheat-it-ta, wheat-it-ta, wheat*, the last syllable sometimes omitted.

No one could doubt the resemblance to Maryland Yellow-throat from these representations.

I find nothing to indicate the duration of the song period, nor whether there is the recurrence of song in fall.

The northern tamarac swamps and bogs are the home of this Warbler. It is one of the "ground warblers," spending much time on the ground.

It is another of the numerous company of warblers of eastern North America, breeding north of the United States. It passes north with the Warbler host in early May.

There are several species whose songs have not been described at all, or inadequately described for the purposes of this paper. They may be given in systematic order.

Lucy's Warbler. *Helminthophila luciae.* 643.

Arizona and extreme southwestern Utah, from the Santa Clara Valley southward to Sonora; New Mexico.

Virginia's Warbler. *Helminthophila virginica.* 644.

“The male is very musical during the nesting season, uttering his *sweet* ditty continually as he skips thru the bushes in search of his morning repast; or having satisfied his appetite, he mounts to the top of some tree in the neighborhood of his nest, and repeats at regular intervals a song of remarkable fullness for a bird of such minute proportions.”—Mr. Aikin, in Nehrling's *Our Native Birds of Song and Beauty*, Vol. I, p. 189.

Rocky Mountain region of the United States, from Wyoming, Colorado, Utah, and Nevada southward on the tableland of Mexico and Guanajuato.

Grace's Warbler. *Dendroica graciae.* 664.

“This beautiful Warbler is pre-eminently a bird of the pines. It is found as soon as the pine belt is entered, and continues almost to its upper limit; but I did not meet with any in the aspens, firs, or spruces above the pines. Its song is a sweet warble, frequently uttered from the lower boughs.”—Dr. E. A. Mearns in *The Auk*, Vol. 7, p. 261.

Southern New Mexico and Arizona, and south into Sonora.

Black-throated Gray Warbler. *Dendroica nigrescens.* 665.

The only description that I have been able to find is that by Nuttall, “*t-shee-tshay-tshaitshce*, plaintive.” It would be difficult to assign its position from so meagre a description.

Western United States, north to Colorado, Oregon and British Columbia west of the Cascades.

Painted Redstart. *Setophaga picta.* 688.

Mountains of Mexico, north to southern Arizona.

Red-bellied Redstart. *Setophaga miniata.* [689.]

Highlands of Mexico. Texas (Giraud).

Red-faced Warbler. *Cardinella rubrifrons.* 690.

Southern Arizona and southwestern New Mexico, thru Mexico to Guatemala.

Red Warbler. *Ergaticus ruber.* [691.]

Highlands of Mexico. Texas (Giraud).

Brasher's Warbler. *Basileuterus culicivorus.* [692.]

Central America, from Panama north to Eastern Mexico. Texas (Giraud).

Bell's Warbler. *Basileuterus belli.* [693.]

Guatemala and Mexico, north to the temperate regions of Vera Cruz. Texas (Giraud).

CONCLUSION.

It is painfully apparent, from the foregoing discussion, that the subject is far from exhausted. We have hardly more than scraped the rind of it yet. We need first of all to learn the songs of the remaining species and sub-species. We need to devise some more perfect method of representing the songs which will admit of more fruitful comparisons than those now in use make possible. We need to follow the whole course of the migrating birds in order to learn what the variations are, where there are any, in the course of the journey northward; and if the breeding song differs from the migrating songs, what the difference is and why. We know so little about the second, or autumn, song period, that it is necessary to study it from the beginning with most species. We know that the females of some species sing, but under what circumstances and what part of the whole song of the species is not known. These are questions which can be answered by careful study.

There are other problems which belong more particularly to the wider subject of bird song, but which a study of Warbler songs will greatly help to solve. How far the sub-species

have departed from the song-type of the species; whether there is a recognizable longitudinal variation in keeping with color variation, as the process of differentiation grows toward the formation of sub-species from merely geographical races; what the difference is between young and old, bright plumaged and dull plumaged birds within the species; what is the effect of environment upon the same individual to determine its effect upon the species; how far imitation determines the quality of the song of the individual. And so we might go on suggesting topics for study to the end of the page. We need only to perceive that the subject is inexhaustable, and a fruitful one for investigation.

A FIELD KEY TO THE SPRING MALES.

- I. Throat red, orange or chestnut.
- II. Throat black or dark slate-color.
- III. Throat yellow, white or whitish ; under-parts without streaks or spots.
- IV. Throat white or whitish ; under-parts streaked or spotted.
- V. Throat yellow ; under-parts streaked or spotted.

I. Throat Red, Orange or Chestnut.

1. Throat chestnut.
 - a. Top of head chestnut ; sides of head black. Bay-breasted Warbler.
 - b. Whole head rich chestnut. (Extreme south-west).
Mangrove Warbler.
2. Whole throat, chest and head orange-rufous. (Extreme south-west).
Olive Warbler.
3. Throat orange or flame-color ; crown yellow. Blackburnian Warbler.
4. Throat red.
 - a. Crown and ear-coverts black. (Extreme south-west).
Red-faced Warbler.
 - b. Ear-coverts silvery-white. (Extreme south-west). Red Warbler.

II. Throat Black or Dark Slate-Color.

- A. Belly white.
 1. Back blue-gray ; side of head black and white. (Western).
Black-throated Gray Warbler.
 2. Back deep blue ; a white spot in wing. Black-throated Blue Warbler.
 3. Back black ; a white spot in wing. (Alleghanies). Cairns' Warbler.
 4. Back black ; sides of head yellow and black.
Golden-cheeked Warbler.
 5. Back gray and black ; top and sides of head yellow. (Western).
Hermit Warbler.
 6. Back green ; cheeks and forehead yellow.
Black-throated Green Warbler.
 7. Back olive-green ; line over eye and breast, yellow. (Western).
Townsend's Warbler.
 8. Back grayish ; a large yellow patch in wing.
Golden-winged Warbler.
 9. Back black ; patches of flame-color in wing, on sides of breast and in middle of tail. Redstart.

- B. Belly yellow.
1. Throat slate-color.
 - a. No white eye-ring; breast with traces of black.

Mourning Warbler.
 - b. A white eye-ring; breast with no traces of black.

Connecticut Warbler.
 - c. A white spot on eyelid; sides of head black. (West-ern).

Macgillivray's Warbler.
 2. Throat black.
 - a. Forehead and cheeks yellow, rest of head black.

Hooded Warbler.
 - b. Forehead yellow; crown with a black patch.

Bachman's Warbler.
- C. Belly red.
1. A large white patch on wing; no chestnut on head.

(South-west). Painted Redstart.
 2. No white wing patch; chestnut patch on crown. (South-west).

Red-bellied Redstart.

III. Throat Yellow, White or Whitish; Underparts Without Streaks.

- A. Large as a Catbird.
1. Back olive-green; throat and breast rich yellow.

Yellow-breasted Chat.
 2. Back olive-gray. (Western).

Long-tailed Chat.
- B. Much smaller.
1. Throat yellow.
 - a. Whole head, neck and breast bright yellow.

Protonotary Warbler.
 - b. Forehead and cheeks black; line over yellow eye.

Kentucky Warbler.
 - c. A broad, rounded black patch on cheeks.

Maryland Yellow-throat.

(NOTE.—An artificial key to the Yellow-throats would be of such doubtful value a-field that the reader is referred to the habitat of the different forms in the body of the paper).

- d. Head and back olive-green; two white wing-bars.

Pine Warbler.
- e. Crown bluish ash or gray.
 1. Upper tail-coverts yellowish olive-green.
 - (a). Lower parts yellow.
 - (1). Yellow intense. (Western).

Calaveras Warbler.
 - (2). Yellow less intense.

Nashville Warbler.
 - (b). Lower parts white or whitish. (Western).

Virginia's Warbler.
 2. Upper tail-coverts chestnut. (Western).

Lucy's Warbler.

- f. Forehead yellow; a black line in front of eye.
Blue-winged Warbler.
- g. Forehead yellow; crown black.
1. Duller colored. Wilson's Warbler.
2. Brighter colored. (Western). Pileolated Warbler.
- h. Head bluish; breast with a chestnut patch.
1. Underparts yellower; less black on side of head.
Parula Warbler.
2. Underparts duller; side of head blacker.
Northern Parula Warbler.
3. Same as 1 and 2. (Extreme south-west). Sennett's Warbler.
- i. Head ash-gray; line over eye yellow. (South-west).
Grace's Warbler.
- j. Top of head with black stripes.
1. Lores chestnut. (South-west). Brasher's Warbler.
2. Lores black. (South-west). Bell's Warbler.
- III. Throat white or whitish.
- a. Crown with two blackish stripes. Worm eating Warbler.
b. Crown plain brown. Swainson's Warbler.
c. Crown bluish-ash; back olive green. Tennessee Warbler.
d. Crown with a partially concealed patch of rufous brown;
back dull olive-green; underparts pale yellow.
Orange-crowned Warbler.
- ee. Above bright olive-green; brighter underneath.
(Western). Lutescent Warbler.
Another western form, not very different, is Dusky Warbler.

IV. Throat White or Whitish; Under-parts Streaked or Spotted.

- A. A patch of yellow on the side of the breast.
1. Crown and rump with a yellow spot. Myrtle Warbler.
There is no field character to distinguish the western
form. The wing and tail are longer. Hoover's Warbler.
2. Yellow band on middle of wing and tail. Immature of Redstart.
- B. No yellow patch on side of breast.
1. With conspicuous wing bars.
a. Back bright bluish. Cerulean Warbler.
b. Back grayish; crown black. Black-poll Warbler.
c. Back greenish yellow; sides chestnut. Chestnut-sided Warbler.
2. Without wing-bars. Walking Warblers.
a. Middle of crown with a rufous streak. Oven-bird.
b. Crown plain; line over eye buff. Water-Thrush.
The form from Illinois westward is larger.
Grinnell's Water-Thrush.
c. Crown plain; line over white eye. Louisiana Water-Thrush.
3. Everywhere streaked black and white. Black and White Warbler.

V. Throat Yellow, Under-parts Streaked or Spotted.

A. Belly white.

1. Line over eye yellow in front of eye. Yellow-throated Warbler.
2. Line over eye entirely white. Sycamore Warbler.

B. Belly yellow.

1. Streaks on the underparts rufous brown.
 - a. Crown yellow, back greenish. Yellow Warbler.

(NOTE.—The south-western form, with back yellower and streaks underneath almost obsolete, is Sonora Warbler.

The darker form inhabiting Alaska to British Columbia, is Alaskan Yellow Warbler).

b. Crown Chestnut, back brownish.

- (1). Underparts soiled yellowish-white. Palm Warbler.
- (2). Underparts entirely bright yellow. Yellow Palm Warbler.

2. Streaks or spots on the underparts black.

- a. A yellow spot on crown and rump. (Western).
Audubon's Warbler.
- b. Back grayish, unstreaked; a necklace of black spots on the breast. Canadian Warbler.
- c. Back greenish, streaked with black; crown bluish.
Kirtland's Warbler.
- d. Back greenish, streaked with black; ear-coverts rufous.
Cape May Warbler.
- e. Back greenish, with a patch of rufous brown. Prairie Warbler.
- f. Back black; crown grayish; tail black with a white band across the middle. Magnolia Warbler.

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